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The Picture Interpretation Test (Torrance and Grossman, 1967) was used in a battery of creative tests as part of a construct validity test. The test was administered to 46 boys and 37 girls in five first grade classrooms in a Clayton County, Georgia, elementary school. The purpose of the test was to measure the child's ability to "read a picture." A subject was presented a novel stimulus and asked to agree or disagree with statements concerning the picture. When a factor analysis was performed on the data, four factors emerged: (1) some measure of general intelligence, (2) a general index of academic achievement, (3) figural measures of creative thinking, and (4) verbal creativity measures. The factors were then correlated with the following results: (1) Verbal creative thinking was independent of general intelligence, academic achievement, and figural creativity; and (2) figural creativity shared common variance with general intelligence and academic achievement. The independence of the verbal creative thinking factor was incongruous, since many other studies reported at least a low correlation between verbal creative thinking and academic achievement or general intelligence. The results suggest that a replication be conducted with particular attention to perceptual sensitivity tasks. (JS)

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SOME DIMENSIONS OF CREATIVE THINKING ABILITY ACHIEVEMENT, AND INTELLIGENCE IN FIRST GRADE

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SOME DIMENSIONS OF CREATIVE THINKING ABILITY, SCHOOL ACHIEVEMENT, AND INTELLIGENCE IN FIRST GRADE[1]

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The purpose of the present study was to explore the relationships among figural and verbal creative thinking abilities, language and non-language intelligence, and school achievement in a sample of first grade children. Specifically, two questions were asked: (1) What common variance is shared between language and non-language intelligence, and figural and verbal creative thinking abilities, and (2) To what extent are these measures related to school achievement?

While these questions are certainly not original in creativity research, relatively few factor analytic studies have been concerned with these questions at the first grade level. Previous studies at other grade levels have generally found low to moderate correlations between measures of intelligence and achievement and measures of creative thinking ability (Bowers, 1960, 1967; Bish, 1964; Ohnmacht, 1966).

Investigations of creative behavior in young children still remain a relatively unexplored research area. Methodological difficulties, for example, have centered about the creation of test materials appropriate for use with these age levels. Furthermore, the problem of criteria for creative behavior becomes even more perplexing when young children are considered. Starkweather (1964), for example, has questioned whether the criteria used for older children and adults can actually be differentiated among young children. Unlike Torrance and others who have used a statistical infrequency criterion (Torrance, 1966; Maltzman, 1960; Cropley, 1966), Starkweather uses each child as his own measure of originality; that is, the most original child is the one with the greatest number of varied responses.

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[1]Paper read at American Educational Research Association, Los Angeles, California, February 5-8, 1969.

In general, early attempts to research creative behavior in children have consisted of subjective observations of children's play or work. Creative activities of preschool children have been described, and in some cases, analyzed with respect to their drawings and paintings (Grippen, 1933; Griffiths, 1945; Alschuler & Hattwick, 1947; McDowell & Howe, 1941), story-telling (Pitcher & Prelinger, 1963), and block-building and clay modeling (Andrews, 1930; McDowell & Howe, 1941).

More recently, the development of paper-and-pencil instruments (Torrance, 1966; Starkweather, 1964) has again stimulated creativity research with young children. While traditional types of validity studies have not typified the assessment of creative behavior, this finding is not surprising in view of the fact that a person can behave creatively in an almost infinite number of ways (Torrance, 1966, p. 23). Lieberman (1965), for example, using a group of kindergarten children, investigated the relationship between playfulness in children's behavior and creative thinking abilities. In another study, Cartledge and Krauser (1963) found statistically significant growth in creative thinking abilities when experimental first grade children were given practice in creative thinking exercises.

Method and Procedures

The subjects of this study were eighty-three first grade children (46 boys and 37 girls) enrolled in five classrooms in an elementary school in Clayton County, Georgia. After five weeks of school, Figural Form A of the Torrance Tests of Creative Thinking was administered in classroom groups, and Verbal Form A of this battery was administered orally and individually by a research team under the supervision of Dr. E. Paul Torrance. In addition, all children were administered the Metropolitan Readiness Tests, the California Test of Mental Maturity, the Metropolitan Achievement Tests, and the Picture Interpretation Test (Torrance and Grossman, 1967). Information concerning the first five tests is available in numerous sources.

The Picture Interpretation Test is currently under development and was included in the testing battery as part of a construct validity study. The Picture Interpreta-

tion Test was developed to measure a child's ability to "read a picture." The child is presented with a novel stimulus picture and is asked to agree or disagree with statements concerning the content of the picture.

All of the data were then scored and coded and IBM cards were key-punched. A total of twenty measures was obtained and intercorrelated. The resulting R matrix was subjected to a principal-components factor analysis with unities in the main diagonal. Two criteria were employed to determine the appropriate number of factors to be retained for rotation. Following the rule of Kaiser (1960), rotating all factors with eigenvalues greater than one resulted in a five factor solution, while a plot of the eigenvalues, using Cattell's Scree Test (1966) suggested four factors. In order to achieve a simple structure, Orthogonal Varimax and oblique rotations by the Maxplane method (Eber, 1966; Rentz, 1968) were performed for both the four and five factor solutions. Examination of the rotated factor structures indicated that an oblique four factor solution most nearly conformed to a simple structure. This solution seemed to suggest psychologically and statistically defensible interpretations for the four factors.

Findings

The Four Factor Solution

Table 1 presents the rotated factor pattern coefficients for the oblique four factor solution.

Insert Table 1 About Here

Factor I most clearly represented some measure of general intelligence. This factor loaded primarily on the language and non-language measures of intelligence. Additionally, moderate loadings on Arithmetic Concepts and Skills, Word Meaning, Listening, Matching, and Numbers suggest that these measures tapped traditional areas of intelligence, for example, vocabulary and abstract reasoning.

Factor II seemed to represent a general index of academic achievement and included the measurement of skills related to success in classroom situations. On the Metropolitan Achievement Tests, substantial loadings were obtained for Word Knowledge, Word Discrimination, and Reading Sentences, while on the Metropolitan Readiness Tests, such subtests as Alphabet, Numbers, Word Meaning, and Copying contributed to loadings on this factor.

Factor III was clearly defined by the figural measures of creative thinking ability. With the exception of a moderate loading contributed by the Picture Interpretation Test, this factor was remarkably distinct.

Factor IV also emerged with rather clearly defined loadings on the verbal creativity measures. Again, the Picture Interpretations Test contributed a moderate loading, while the contribution of the remaining measures was minimal.

The Factor Correlations

Table 2 presents the factor correlations for the four factors previously described.

Insert Table 2 About Here

Inspection of the factor correlations revealed two distinct patterns. First, the verbal creative thinking factor clearly emerged as an independent dimension. It was remarkably independent of the general intelligence, academic achievement, and figural creative thinking factors. Secondly, unlike the verbal creativity factor, the figural creativity factor shared common variance with both the general intelligence and academic achievement factors. In summary, verbal creativity shared negligible common variance with the remaining factors and emerged as a distinct and independent dimension, while moderate relationships were found among the general intelligence, academic achievement, and figural creativity factors. These factors, however, could nevertheless be identified as separate and distinct dimensions. The clarity of the figural and verbal creativity factors would also seem to lend support to Torrance's (1966) rationale for developing both a figural and verbal form of the Torrance Tests of Creative Thinking.

Discussion and Implications

The findings of this study suggest several areas of discussion. The failure of the verbal creativity factor to correlate with the intelligence, academic achievement, and figural creativity factors is an incongrous finding. As pointed out earlier, at higher grade levels low to moderate coefficients of correlation have been reported between measures of verbal creativity and measures of academic achievement. In a review of approximately 300 reports, abstracts, and journal reprints which employed his creative thinking battery, Torrance (1968) reported that the median of 65 coefficients of correlation between creativity measures, and standardized measures of school achievement was .28. Similarly, the relationship between intelligence and verbal creativity has been reported to be higher than the relationship found in the present study. In the same review, Torrance reported that of 88 coefficients of correlation between measures of intelligence and verbal creativity, the median correlation was .21.

Possibly, a clue in understanding the findings of this study is suggested when the factor loadings for the newly developed Picture Interpretation Test are examined. As can be seen, the loadings on this measure are complex and each factor contributes to its interpretation, particularly the figural and verbal creativity factors. This finding may point out that the figural and verbal creativity measures may share in common tasks which measure young children's ability to be stimulated visually. Thus, perceptual sensitivity may be an important determinant of performance on the Torrance measures.

The present study suggests that a replication be conducted, with the particular addition of a battery of tests which require perceptual sensitivity to be selected tasks. A dilution of the clarity of the figural and verbal creativity factors would support the hypothesis that perceptual sensitivity is important on these tests while negative or inconclusive results would suggest some alternative hypothesis.

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TABLE 1

Rotated Factor Pattern Coefficients for Twenty Measures of Creative Thinking Ability, School Achievement, and Intelligence

Test Measures	Factor Loadings[a] I	II	III	IV
1. Figural Fluency	-00	05	86	07
2. Figural Flexibility	-04	-01	92	-07
3. Figural Originality	-10	-06	96	-01
4. Figural Elaboration	16	11	40	27
5. Verbal Fluency	03	04	-01	87
6. Verbal Flexibility	05	07	-06	83
7. Verbal Originality	-00	-03	07	77
8. Word Meaning	42	44	-11	01
9. Listening	47	25	01	08
10. Matching	42	30	04	03
11. Alphabet	-09	85	11	-02
12. Numbers	42	63	-08	05
13. Copying	25	44	19	-02
14. Language IQ	78	08	-07	-07
15. Non-Language IQ	76	-10	07	-29
16. Picture Interpretation	34	21	-41	41
17. Word Knowledge	-02	91	06	09
18. Word Discrimination	-03	92	05	-08
19. Reading Sentences	-09	90	00	04
20. Arithmetic Concepts and Skills	58	33	-04	-08
Hyperplane Count	10	9	14	14
% in Hyperplane = .587				

[a] Decimals have been omitted

Table 2

Factor Correlations

	I	II	III	IV
I	--	.42	.41	.07
II		--	.44	.01
III			--	.09
IV				--

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